

Project Name	Venezuela-Millennium Science
Region	Latin America and the Caribbean Region
Sector	Other Social Sector
Project ID	VEPE66749
Borrower(s)	Bolivarian Republic of Venezuela
Implementing Agency	Ministry of Science and Technology
Environment Category	C
Date PID Prepared	February 4, 2000
Projected Appraisal Date	February 15, 2000
Projected Board Date	April 13, 2000

1. Country and Sector Background

Main sector issues

The government sponsored S&T research system in Venezuela consists of 19 public universities and several research institutes, with IVIC being the largest. Despite of some recent efforts to improve the quality of research, such as the "Researcher Promotion Program" (Programa de Promoción del Investigador - PPI), and "University Extension Programs", the Venezuelan S&T system is still constrained in ways that substantially hinder its performance. For instance, major bottlenecks to advanced training keep Venezuela's supply of human resources for S&T insufficient for renewal and growth. Resources for R&D are generally scarce and fragmented. Funding and implementation procedures do not appropriately support good research output. Planning for the sector is weak and uncoordinated. Together, these factors perpetuate a system that is small, not efficient and flexible enough, and relatively isolated rather than integrated on national and international levels. The main constraints can be classified in two groups: (a) procedures and practices that inhibit optimal performance in research and training, and (b) scarcity of resources, both human and capital.

(a) Procedures and practices that inhibit optimal performance in research and training

Quality and relevance of research are often inadequate. In 1999, the research system in Venezuela consists of approximately 5,000 researchers, but only about one third of them qualify according to the standards of the Venezuelan Researcher Promotion Program (Programa de Promoción del Investigador - PPI) as international-scale researchers with publications in journals included in the Science Citation Index (SCI). According to the PPI statistics, Venezuelan scientists publish 600-700 scientific papers in internationally recognized journals per year (in average each PPI researcher publishes 1 paper per two years). The number of patents is very low. According to Cetto & Vessuri, 1998, data from CYTED/RICYT 1997, Venezuela contributes less than 0.05% of world's scientific articles, which is far less than Chile (0.2%), Mexico (0.3%), Argentina (0.4%), and Brazil (0.6%).

Efficiency and quality of research are not stimulated enough and not systematically evaluated and rewarded. Except for some notable voluntary efforts, there are no quality assessment mechanisms nor direct financial or promotional incentives for researchers and university teachers in public sector to improve the quality, relevance and efficiency of research. By contrast, most private higher education institutions (except from a few traditional private universities, such as P. Universidad Catolica de Venezuela) are driven by profit, and therefore most often do not undertake any research at all.

Conditions and quality of research are disparate. At present, more than eighty percent of PPI qualified researchers work in five strongest research and education institutions. Almost all of PPI researchers come from public universities and institutes with longest scientific tradition, while S&T research groups are practically non-existent at private higher education institutions. The main reason for this is the governmental financial policy, which only supports national (public) educational and research institutions.

Excessive bureaucratic constraints hamper researchers. Bureaucratic procedures significantly diminish researcher effectiveness. One example of these restrictions is that research groups at public universities and institutes are not free to replace a retired member of the group, or to enlarge the number of Ph.D. students in the lab, even if they work in a rapidly expanding field and have a promising research program. On the other hand, there may be a surplus of researchers and teachers in another field. Cooperation between different faculties, universities and research institutes is also very difficult and rare, which makes interdisciplinary research almost impossible.

Insufficient long-term planning. Policy and long-term planning for the S&T sector has been generally weak and uncoordinated. Until recently, the responsibility for S&T policy has not been clearly assigned to any agency or institution. Recently, a new Ministry of Science and Technology (MS&T) has been created, which will be responsible for science and technology policy, for coordination, and for the implementation of policy instruments.

(b) Scarcity of resources

Number of researchers in S&T is too small. In 1995, according to UNESCO statistics, Venezuela had 208 scientists and engineers in R&D per million of inhabitants, which is about ten times less than in the industrialized countries.

The present influx of new Ph.D. graduates cannot cover the needs. Higher education sector in Venezuela is in rapid expansion. The total enrollment of higher education students increased by 66.4% in ten years. Currently, only about 100 Ph.D. students graduate per year, which cannot replace retired professors at tertiary education institutions alone. Additionally, more highly qualified S&T specialists are needed to build a solid knowledge base in research institutes and industrial R&D departments in areas that are key to the economic and social development of Venezuela.

Scarcity of funds for necessary equipment limits the scope of research in Venezuela and virtually excludes Venezuelan scientists from working on cutting edge research problems in advanced areas in many disciplines. They

simply cannot afford the equipment needed for such work.

Government strategy

In Venezuela, research has been mainly limited to public universities with the longest tradition, and to large research institutes, such as IVIC. Until recently, long-term planning for science and technology (S&T) has been uncoordinated, and the resources for R&D relatively scarce and fragmented. The result was a S&T system with a limited scope, reduced flexibility and efficiency, which was isolated rather than integrated on national and international levels. The goal of the present government and the newly established Ministry of Science and Technology is to improve the S&T system, both in quality and in quantity, with the concomitant social and economic impacts, to be able to better support the country's development efforts.

The new S&T minister's vision is to (i) establish coherent policies in the national science and technology sector, and (ii) consolidate a National Innovation System (NIS), (iii) introduce incentives for the formation of the critical mass of high quality researchers, and (iv) support research and development in priority technological areas (food technology, biotechnology, metallurgy and petrochemistry, infrastructure and informatics, environmental science and technology).

The MS&T will have two Vice Ministries: (1) Vice Ministry for Planning and Policy, responsible for S&T production, policy analysis and formulation, planning, institutional cooperation (with universities, research laboratories, national institutes and R&D entities of other ministries) and international cooperation; (2) Vice Ministry for Research and Innovation, responsible for human resources, research and development, technology transfer, monitoring and evaluation. The Ministry will further establish cross cutting task forces or working groups that will work across sectors and directorates in the selected areas of research, such as biotechnology.

The MS&T also anticipates the need to modernize the modus operandi of the Consejo Nacional de Investigaciones Científicas y Tecnológicas (CONICIT) and its funding instruments and strategies.

The World Bank has responded to the Government's request for assistance with a proposed LIL. The LIL would assist in (a) the initiation of new policies and (b) with the establishment of a technology fund - Fondo Tecnológico, which would support the Minister's agenda by establishing a competitive environment for state-of-the-art S&T research and incentives for national and international networking.

2. Objectives

The purpose of the project is to strengthen Venezuela's R&D capacity so that the country can gain access to global knowledge and improve the knowledge base in areas that are key to its economic and social development. This would be accomplished through the support of advanced training of human capital by international level scientists engaged in high quality research.

The project Millennium Science Initiative (MIS) has two phases: (1) a learning and innovation phase supported by a Learning and Innovation Loan (LIL) - for two years, and (2) a follow-on phase related to potential

improvements in the sector which will follow if the LIL leads to successful follow-on activities - for additional eight years.

The specific project development objective is to explore and demonstrate how to revitalize Venezuela's science and technology (S&T) system. The project is expected to energize the R&D sector that is in many cases characterized by excessive bureaucracy. It will demonstrate and stimulate adoption of transparent quality assessment mechanisms and efficient merit-based allocation procedures. The project will encourage investigator autonomy in improving the quality and efficiency of scientific research and training and will reward research system productivity and efficiency. The project will also promote integration and partnership with more scientifically advanced countries, as well as with Venezuela's regional partners.

An important objective of the LIL is to show that, under proper procedures, Venezuela can perform S&T research at high international standards of quality and productivity, and that the high quality international level scientific research can be expanded and sustained within Venezuela's S&T research budget. The LIL is therefore planned as an initial phase of a larger MSI program, which would in a period of eight to ten years spread positive experiences from the LIL phase to the rest of the S&T system in Venezuela.

The follow-on development objective is to revitalize the Venezuelan national innovation system by increasing the country's capacity to produce, gain access to, and adapt scientific and technological knowledge. More Ph.D. students would be trained at higher quality and within the country, increasing the cost-effectiveness of the training. More and higher quality scientific output is expected, some of which may have direct implications for industry. The cumulative effect of increased human capital and knowledge stocks would, in the long term, move Venezuela closer to parity with the world's more knowledge-based economies.

The LIL will partly finance: (a) capacity building for the new Ministry of Science and Technology, with technical support to set up national S&T policies and a light management structure for MSI; (b) competitive fund for scientific excellence to support: (i) 3-5 established international level research groups, with investigator autonomy and adequate levels of longer-term funding, known as "Centers of Excellence" (CE), and about 8-12 emerging groups of high quality younger researchers, with investigator autonomy and adequate levels of medium-term funding, known as "Nuclei for Excellent Research" (NER); (ii) national and international networking and outreach activities for the promotion of scientific excellence, that promote exchange of knowledge and spread the benefits of top-quality research to potential collaborators and benefactors, be they students, fellow researchers, and/or partners from business and industry.

An important feature of the LIL will be a selective process for granting awards. This process is planned to include participation of high level international scientists, and fund only researchers whose work is deemed to be at internationally accepted standard of quality and productivity.

3. Rationale for Bank's Involvement

4. Description

A. Capacity building: Capacity for Change and Management Structure for Millennium Science Initiative "Ministry, CONICIT and the MSI Directorate"

B. Competitive fund for Scientific Excellence:

B1. Centers and Nuclei of Scientific Excellence
Funding of research projects at about 3-5 CE and about 8-12 NER

B2. Network for the promotion of Scientific Excellence
Funding of visits, exchange programs for researchers, post-docs and graduate students, design and delivery of international advanced courses, dissemination of lessons learned

5. Financing

	Total (US\$m)
Government	10
IBRD	5
IDA	
Total Project Cost	15

6. Implementation

7. Sustainability

8. Lessons learned from past operations in the country/sector

9. Program of Targeted Intervention (PTI) N

10. Environment Aspects (including any public consultation)

Issues : Through its support of environmentally sound research projects (one of the Venezuela's priority research areas) and through practices for laboratory safety and disposal of hazardous materials, the project is expected to have a positive impact on environment.

11. Contact Points:

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Note: This is information on an involving project. Certain components may not be necessarily included in the final project.

Processed by the InfoShop week ending February 11, 2000.